CLAIMS

1. Process for evaluating the quality of coded images, characterized in that it comprises:

a) a step of processing the signal representative of the image so as to obtain a processed signal,

b) a step of constructing on the basis of the signal representative of the coded image, a signal representative of the field of motion image on the basis of the source sequence,

c) a step of building a signal representative of the segmenting of the field of motion and of storing the image pixels representative of each region having a different field of motion at an address defined with respect to the velocity vectors estimated in the step of constructing the field of motion making it possible to determine the pixels having different velocity vectors,

d) a step of determining or of calculating a psychovisual human filter to be applied as a function of the estimated velocity of the region,

e) a step of filtering the processed signal, and

f) a step of constructing the map of disparities between the signals representative of the image which are obtained after the filtering step and the signals representative of the decoded image which are obtained after the filtering step.

2. Process for evaluating the quality of coded images according to Claim 1, characterized in that it comprises a step consisting in applying each of the preceding steps to the source image and to the decoded image.

3. Process for evaluating the quality of coded images according to Claim 1, characterized in that it comprises a step of frequency decomposition of the images (FFT, subband, etc.) which precedes the filtering step and consists of a weighting by a coefficient deduced from curves taking into account the estimated velocity and the frequency band considered, so as to take account of the relative influence of the velocity and of the spatial frequency on the perception of the moving images.

4. Process according to Claim 1, characterized in that the psychovisual filtering step is applied to matrices representative of the inter-pyramid differences between the Laplace pyramids of the processed source images and those of the processed decoded images after weighting by, on the one hand, the local influence representative of the frequency of the pixel concerned and, on the other hand, a filtering coefficient deduced

from filtering curves taking into account the estimated velocity and the frequency band corresponding to the level of the Laplace pyramid to which the pixel belongs in a multiresolution pyramid obtained by constructing a pyramid on the basis of the image of each region of different velocity.

5. Process according to Claim 1, characterized in that the psychovisual filtering curves are either built from a succession of curves arranged in the form of a database and stored in the system, and possibly interpolation on the basis of these curves, or obtained by analytical representation implemented by calculation means making it possible to calculate each curve.

6. Process according to Claim 4, characterized in that the step of constructing the map of disparities is performed by recomposing the filtered multiresolution pyramids obtained in the preceding step.

7. Process according to Claim 4 or 6, characterized in that the step of processing the image comprises a step of decomposing the source and decoded images into a Laplace pyramid of n levels and a step of constructing the inter-pyramid difference.

8. Process according to Claim 1, characterized in that the velocity or local value of the motion is obtained by possible construction of filters followed by application of the filter constructed or by application of a median filter.

9. Process according to Claim 1 or 4, characterized in that it comprises a step of precorrecting the images by performing a Gamma correction and a correction by Weber's law.

10. Process according to Claim 7, characterized in that the Gamma correction γ is as follows:

$$y = K_S V^{\gamma s} \text{ with } V = k_a E^{\gamma a}$$

in which y is the luminance, V the luminance voltage, E the illumination of the illumination analysed image, γ_s is an exponent of around 2.2 for black and white picture tubes and γ_a has a value of 0.45 commonly agreed for colour television.

11. Process according to Claim 1, characterized in that the filtering is obtained by constructing the psychovisual filter corresponding to the velocity estimated on the basis of a database of filters and interpolation between the two filters corresponding to the regions closest to the region whose velocity has been estimated.

12. Process according to Claim 4, characterized in that the relative local influence (I_n) of the pixel p_i concerned is obtained by calculating a value E_n representing the q^{th} power of the inter-pyramid level-to-level difference between the source pyramids and decoded pyramids of like level of the pixel concerned.

13. Process according to Claim 12, characterized in that the calculation of I_n is performed by using the following formula:

$$I_n = \frac{E_n}{\sum_{k<n} m(E_k)}$$

with $E_n = (\mathrm{Diff}_n(p_{ij}))^q$,

$m(E_k) = E_k$ if $E_k > S$

and $m(E_k) = S$ if $E_k < S$

with for example S = 0.5% (maximum possible value of E_k).

14. Process according to Claim 4, characterized in that the filtering comprises a directional filtering of the images in a determined direction rather than in another.

15. Process according to Claim 9, characterized in that the Gamma correction is performed by a calculation device implementing the following equation:

$$L_{display} = L_{max}\left(\frac{e}{e_{max}}\right)^{\gamma}$$

e being the grid level value of the pixel, e_{max} being the maximum value example 256 if the coding is performed on 8 bits, L_{max} being the intensity corresponding to e_{max} in cd/m^2.

16. Process according to Claim 9, characterized in that Weber's law is implemented by a calculation device which carries out the following function:

$$V_{out} = \frac{L_{max}}{2} Log_{10}\left(1+100\frac{L_{display}}{L_{max}}\right)$$

17. Process according to Claim 1 or 4, characterized in that the calculation of the filter is obtained through the following formula:

$$G(\alpha,v) = [6.1 + 7.3\,|\log(v/3)|^3] \times v\alpha^2 \exp[-2\alpha(v+2)/45.9]$$

with $\alpha = 2\pi f$, f = spatial frequency, v = velocity.

18. Use of the process according to one of the preceding claims in a coding device, characterized by a dynamic retroaction as a function of the psychovisual disparities calculated by the calculation device implementing

the process on one of the parameters used by the coding device in the course of the coding.

19. Use of the process according to Claim 18, characterized in that the calculated disparities are compared with a threshold so as to modify the coding parameters of the coding apparatus until the desired threshold is overstepped.

20. Use of the process according to Claim 19, characterized in that one of the parameters is either the quantization interval, or the size of the images, or the form of the group of pictures GOP.

21. Use of the process according to Claim 18, characterized in that the homogeneity of the calculated disparities is analysed by the calculation device so as to act on the coding parameters of the coding apparatus.

22. Use of the process according to the preceding claims, characterized in that the coding parameters of the different objects of an image whose coding is object oriented are modified as a function of a constant desired disparity.

23. Use of the process according to Claims 18 to 22, characterized in that it consists in performing a dynamic reallocation of the bit rates allocated to a coding apparatus with multiplexing.

24. Device for evaluating the quality of coded images, characterized in that it comprises:

- a means (1a, 1b) of processing the signal representative of the source image (10a) and of the decoded image (10b) so as to obtain a processed source image signal and a processed decoded image signal,
- means (2a, 2b) of constructing on the basis of the signal representative of each of the images, a signal representative of the estimating of the field of motion on the basis of each of the images of the source and decoded sequences,
- means (3a, 3b) of building a signal representative of the segmenting of the field of motion and of storing the image pixels representative of each region R_i having a different field of motion at an address defined with respect to the velocity vectors estimated in the step of constructing the field of motion making it possible to determine for each of the source and decoded images those having different velocity vectors,
- a means (4, 5) of determining or of calculating a psychovisual human filter to be applied as a function of the estimated velocity of the region,

- means (6a, 6b) of filtering applied to each of the processed source images and processed decoded images and

- a means (7) of constructing the map of disparities between the signals representative of the processed source image which are obtained after the filtering step and the signals representative of the processed decoded image which are obtained after the filtering step.

25. Device according to Claim 24, characterized in that the psychovisual filtering means are applied to matrices representative of the inter-pyramid differences calculated by calculation means between the Laplace pyramids of the processed source images and those of the processed decoded images after weighting by, on the one hand, the local influence representative of the frequency of the pixel concerned and, on the other hand, a filtering coefficient deduced from stored or calculated filtering curves and taking into account the estimated velocity and the frequency band corresponding to the level of the Laplace pyramid to which the pixel belongs in a multiresolution pyramid obtained by means of constructing this multiresolution pyramid on the basis of the image of each region of different velocity.

26. Device according to Claim 24, characterized in that the means of constructing the map of disparities perform a recomposition of the filtered multiresolution pyramids.

27. Device according to one of Claims 24 to 26, characterized in that the means of processing, the means of building, the means of determining, the means of constructing, the means of filtering consist of at least one microprocessor associated with memories sufficient to contain the programs making it possible to embody the various means and to contain the databases and the intermediate information necessary for the calculation and for obtaining the map of disparities.

28. Process according to Claim 1, the images being coded according to the MPEG standard, characterized in that the step of constructing a signal representative of the field of motion image exploits the per-macroblock motion vectors calculated during the coding of the images according to the MPEG standard.

29. Process according to Claim 1, characterized in that the decoded image is a noisy source image constructed on the basis of the source image to which white noise is added.

30. Use of the process according to Claim 29 for predicting, on the basis of the map of disparities, the regions most sensitive "a priori" to the coding errors and for coding the regions as a function of this prediction.

31. Use of the process according to Claim 29 to perform a prefiltering of the source images as a function of the map of disparities.

32. Use of the process according to Claim 29 for determining locally the amount of information which can be inserted into the images (Watermarking) without this addition being perceptible.